Ground Water Rule

October 29, 2008

Selina J. Makofsky

- Provide an overview of the Rule
- Explain requirements for PWSs that use groundwater and those that disinfect

Bob W. Mann

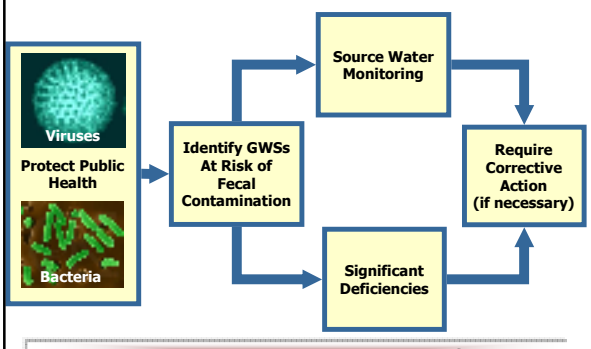
- Discuss corrective action & 4-log removal

http://des.nh.gov/organization/divisions/water/dwgb/index.htm

Commonly used Acronyms/terms

- GWR = groundwater rule
- PWS = public water system
- GWS = groundwater system
- LCR = lead & copper rule
- PN = public notice
- CCR = consumer confidence report
- TCR = total coliform rule
- 4 Log treatment or removal = treatment that kills 99.99% of pathogens present

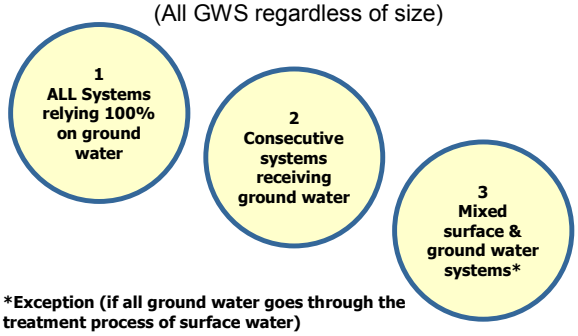
Primary Purpose of the GWR



Source: EPA

To Whom Does the GWR Apply?

(All GWS regardless of size)



*Exception (if all ground water goes through the treatment process of surface water)

Source: EPA

New Hampshire Statistics 2008

2449 public water systems

-Approximately 2340 groundwater systems

-Approximately **360 GWS disinfect**

290 Use chlorination

70 Use UV

2 Use ozone

DES Data 2008

Ground Water Rule
4 key components

- Periodic sanitary surveys
- Corrective action for any system with a significant deficiency **OR** source water fecal contamination

- **Triggered** source water monitoring
- **Compliance** monitoring

Groundwater Rule

What it IS

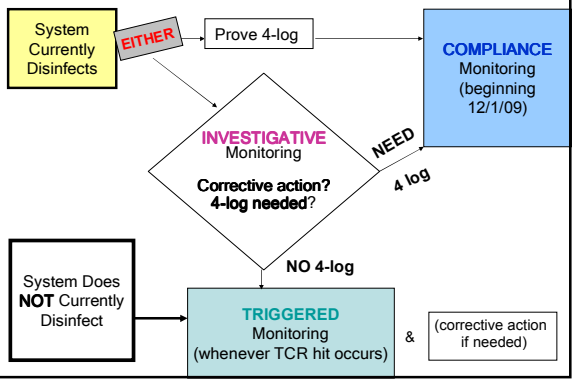
- A way to investigate any possible microbial contamination
- A way to define significant deficiencies throughout the US

What it is NOT

-NOT a requirement for everyone to disinfect

-NOT a requirement for those disinfecting to meet 4-log removal

Ground Water Rule Basics



GWR Compliance Dates

PWS Requirements	Required By:
Investigative Source Monitoring (March through August)	Fall, 2009
Notification of 4-log treatment of viruses (with supporting info)	December 1, 2009
	Required Beginning:
Triggered source water monitoring	December 1, 2009
Corrective actions (for *E. coli* in source OR significant deficiencies)	
Compliance monitoring (to demonstrate 4-log removal)	
New sources placed in service must meet triggered source water monitoring requirements or conduct compliance monitoring for 4-log treatment of water	
Final Rule promulgated in Federal Register November 8, 2006	

SOURCE Water Monitoring

SOURCE Water Monitoring Scenarios

INVESTIGATIVE SOURCE WATER MONITORING (March-August 2009)

- Existing systems with disinfection (pre 12/09)
- To justify eliminating 4-log removal (post 12/09)

TRIGGERED SOURCE WATER MONITORING

- Systems with TCR positive sample

INVESTIGATIVE Source Water Monitoring

(for those currently disinfecting)

BY December 1, 2009

GWSs must conduct investigatory source water monitoring

From March through August 2009
Collect 6 months of source samples & test for *E. coli*

Then….

IF clean- no compliance monitoring required (just triggered)
IF *E. coli* present- Need to perform corrective action **OR** need to provide 4-log removal **AND** conduct compliance monitoring

IF NOT DONE– upgrade to 4-log REQUIRED (& compliance monitoring)

PROPOSED MONITORING

INVESTIGATIVE Source Water Monitoring
(to eliminate 4-log disinfection)
AFTER December 2009

GWSs must conduct investigatory monitoring to be removed from compliance monitoring

Collect 12 months of source samples & test for *E. coli*

And

Have not had any TCR violations for 3 years
Have not had any significant deficiencies for 5 years

PROPOSED MONITORING

SOURCE Water Monitoring Scenarios

INVESTIGATIVE SOURCE WATER MONITORING (March-August 2009)

- Existing systems with disinfection (pre 12/09)
- To justify eliminating 4-log removal (post 12/09)

TRIGGERED SOURCE WATER MONITORING

- Systems with TCR positive sample

TRIGGERED Source Water Monitoring
AFTER December 2009

GWSs must conduct triggered source water monitoring if they:

Are notified of a total coliform-positive routine TCR sample

And

Are NOT on 4-log treatment and conducting compliance monitoring

NOTE: Majority of systems will be in this track

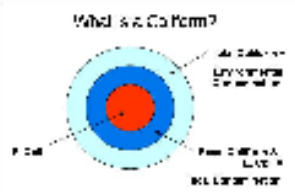
TCR & GWR indicators

TCR sampling:

Monthly, quarterly, or semi-annually for total coliform

Total Coliform is indicator - present in soil, intestines, etc.

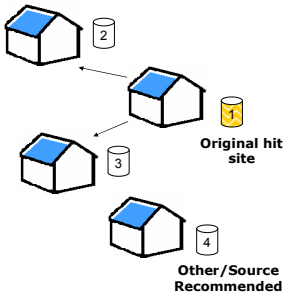
Acute concerns: *E. coli* & fecal coliform



GWR indicator = *E. coli*

GWR Sampling Requirements
(**TRIGGERED** by a Positive TCR Distribution Sample Result)

TCR: Four repeat samples are required w/in 24 hours

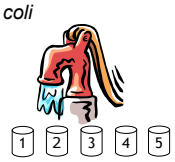


GWR: Source must be analyzed for *E. coli*

Source

Sampling Following a Positive *E. coli*
at Source (Groundwater Rule)

Five samples must be collected from Source within 24 hours & tested for *E. coli*



- Or -

Take corrective action, as directed by DES DWGB

A Boil Water Order is required in either case

TCR triggered summary

- GWR triggered monitoring kicks in when TCR required distribution sample is positive (whether total coliform or *E. coli*)
- One of the repeats can count for the triggered sample
- The importance of clean sampling techniques cannot be stressed enough! Avoid false positives!

Compliance Monitoring

(required for those **providing 4-log treatment**)

COMPLIANCE Monitoring
AFTER December 2009

GWS s must conduct COMPLIANCE water monitoring if they:

Notify & demonstrate to DES IN WRITING (before 12/1/09) that they disinfect to 4-log removal

And

DES establishes monitoring criteria based on disinfection process (to demonstrate 4-log is being met)

NOTE: NOT source water. Triggered monitoring is NOT applicable

Compliance Monitoring

COMPLIANCE Monitoring
Systems Serving > 3,300 People
Using Chemical Disinfection MUST:

- Monitor the residual disinfectant concentration continuously
  - At a location approved by the state (e.g., entry point)
  - Maintain a state-determined minimum disinfectant residual
  - **Record and report** the lowest daily value for residual disinfectant concentration monthly
- If continuous monitoring equipment fails, a system must:
  - Collect grab sample every 4 hours
  - Repair equipment within 14 days

Compliance Monitoring

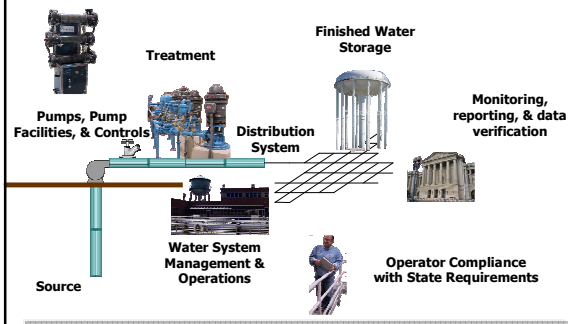
COMPLIANCE Monitoring
Systems Serving ≤ 3,300 People
Using Chemical Disinfection MUST:

- Take daily grab samples during peak hourly flow at a location approved by the state OR
  - Meet all the continuous monitoring requirements described for systems serving more than 3,300 people
- If the disinfectant residual falls below the state-determined minimum concentration:
  - Take samples every 4 hours until the residual meets the required level

Recordkeeping & Reporting is also required

Compliance Monitoring

Sanitary Survey/Significant Deficiencies
Eight Required Elements



Sanitary Surveys Source: EPA

Significant Deficiencies (GWR)

Are deficiencies that may cause, or have the potential to cause, the introduction of contamination into the finished water

- Well is located near a source of fecal contamination
- Storage tanks are poorly cleaned/ maintained
- Not having screened atmospheric vents
- Pumphouse is subject to flooding
- Well cap/cover has sanitary seal problems
- Lack of raw water SAMPLING TAP

Notification of Significant Deficiencies

(basically same as current process)

- States must provide GWSs written notification of significant deficiencies no later than 30 days after identifying the deficiencies
- Notices may also include:
  - Specific corrective actions
  - Deadlines for implementing corrective actions

Corrective Action Options

(also known as treatment techniques)

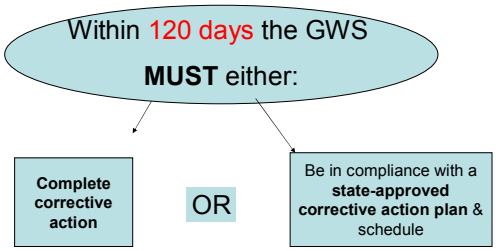
- Correct all significant deficiencies
- Provide an alternative source of water
- Eliminate the source of contamination

- Provide treatment that reliably achieves 99.99% (4-log) treatment (removal or inactivation) of viruses before the first customer **(LAST RESORT)**

Corrective Action Schedule

After notification of **significant deficiency** OR ***E. coli*** in source

System has 30 days to consult with the state



Required Notices to the Public

- Public Notification (PN)- all violations
- Consumer Confidence Report (CCR)
- **Special Notice**
  - Community GWSs – add *E. coli* in CCR & violations
- **Special Notice- NON-community-**

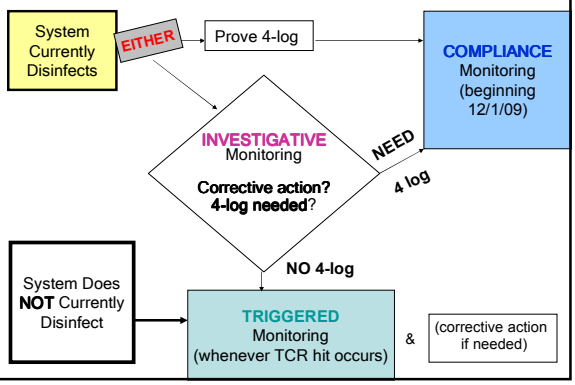
  Uncorrected Significant deficiency – if unable to correct w/in 1 year of date identified.

  Notify annually until sig. def. has been addressed

Keep in mind…

- Just because you disinfect, doesn't mean you have to update to 4-log removal …
- For 2008 out of 13,000 routine samples, 5% had hits & would have been triggered into GWR …
- Only 30% of hits were confirmed … 70% due to? Sampling error? Distribution system problems?
- Upkeep of infrastructure is important
- Positive TCR distribution samples trigger LOTS of work for you and us!
- BE CAREFUL to sample correctly!

Ground Water Rule Basics



Corrective Action

If

- There is confirmed E Coli in the well, or
- There are unresolved significant deficiencies

Then

- System must undertake corrective action

4 Corrective Action Options

- Correct all significant deficiencies
- Provide an alternate source of water
- Eliminate the source of contamination
- Provide treatment that reliably achieves 99.99% (4-log) inactivation and/or removal of viruses

Source: EPA webinar

Understanding "log"

"Log" refers to the percent of microorganisms that is removed or inactivated by treatment

Log	% removal/inactivation
0.5-log	68.4%
1-log	90%
2-log	99%
3-log	99.9%
4-log	99.99%
5-log	99.999%

Source: EPA Webinar

4-log virus treatment

- Chemical disinfectants
  - Chlorine
  - Chlorine dioxide
  - Chloramine
  - Ozone
- UV disinfection
- Membrane filtration

Simplified CT Table

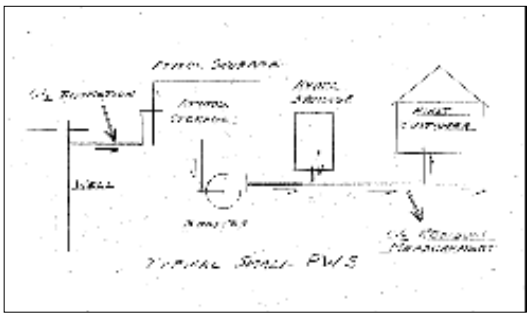
CT Values for 4-log inactivation of viruses by free chlorine, pH 6.0 – 9.0
Units in mg/L-min.

Temp. (ºC)	5	10	15
CT	8	6	4

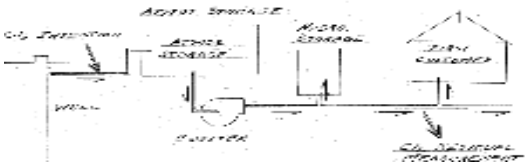
Calculation of CT

- C = Free chlorine residual at or before first customer
  - Measured with DPD kit or continuous monitor
- T = Time from point of application to point of measurement
  - Based on pipe and tank volumes divided by flow rate
- Units in mg/L-min

CT Calculation



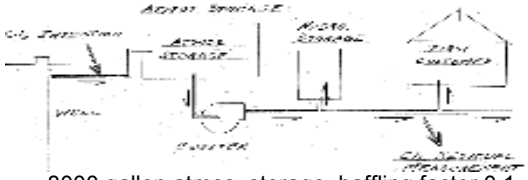
CT Calculation



- C x T must be greater than CT required for 4-log inactivation (from table)
- C = free chlorine mg/L at or before first customer
- T = contact time in minutes = volume / peak flow

$$T = \frac{\text{Piping volume + useable storage (gal)}}{\text{Peak flow rate (gal/min)}}$$

CT Calculation Example



- 8000 gallon atmos. storage, baffling factor 0.1
- 200 ft of 4-inch pipe to first customer, C = 0.2 mg/l
- Peak water demand = 150 gpm
- So T = 6.2 min at peak flow, so CT = 1.24
- At 5ºC, required CT = 8 mg/L-min
- To meet CT, C must be 1.3 mg/L at peak flow

Simplified CT Table

CT Values for 4-log inactivation of viruses by free chlorine, pH 6.0 – 9.0
Units in mg/L-min.

Temp. (C)	5	10	15
CT	8	6	4

Ways to increase CT to meet 4-log requirement

- Increase C by adding more chlorine
- Increase T by
  - Add baffles to existing storage tank
  - Add a new baffled contact tank or
  - Increase size of a section of pipe

Keep in mind

- If 4-log disinfection is required, then daily compliance monitoring is required
- For systems providing required 4-log disinfection
  - Systems >3300 must provide continuous residual monitoring
  - Systems <3300 must take daily grab sample for chlorine residual during peak flow
  - All systems must report monthly to DES
- Pursue other means of corrective action first

DES contacts

Selina J. Makofsky
selina.makofsky@des.nh.gov
(603) 271-4109

Bob Mann
robert.mann@des.nh.gov
(603) 271-2953

?

http://des.nh.gov/organization/divisions/water/dwgb/index.htm